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EXAMINER	
YEH, EUENG NAN	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/500,562	KAMEI, TOSHIO	
	Examiner	Art Unit	
	EUENG-NAN YEH	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 November 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed November 20, 2008 has been entered.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 1-8 are rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. Supreme Court precedent (*Diamond v. Diehr*, 450 U.S. 175, 184 (1981); *Parker v. Flook*, 437 U.S. 584, 588 n.9 (1978); *Gottschalk v. Benson*, 409 U.S. 63, 70 (1972); *Cochrane v. Deener*, 94 U.S. 780, 787-88 (1876)) and recent Federal Circuit decisions (*In re Bilski*, 88 USPQ2d 1385 (Fed. Cir. 2008)) indicate that a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing. While the instant claims recite a series of steps or acts to be

performed, the claims neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process. In order for a process to be "tied" to another statutory category, the structure associated with another statutory category must be positively recited in a step or steps significant to the basic inventive concept, and NOT just in association with statements of intended use or purpose, insignificant pre or post solution activity, or implicitly. For example the method claim 1 comprises following steps: clipping areas, extracting features, projecting feature vectors wherein none of above processes positively "tied" to another statutory category.

4. The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows (see also MPEP 2106):

> Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.
>
> When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare In re Lowry, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and Warmerdam, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).

> In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035.

Claims 9-16 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 9-16 define a "unit". However, the body of the claim lacks definite structure indicative of a physical apparatus. Furthermore, the specification indicates that the invention may be embodied as software, see specification page 13, line 19 "the above-mentioned face metadata generation procedure can be executed through a computer according to a computer program". Therefore, the claim as a whole appears to be nothing more than a "unit" of software elements, thus defining functional descriptive material *per se*.

Functional descriptive material may be statutory if it resides on a "computer-readable medium or computer-readable memory". The claim(s) indicated above lack structure, and do not define a computer readable medium and are thus non-statutory for that reason (i.e., "When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized" – Guidelines Annex IV). The scope of the presently claimed invention encompasses products that are not necessarily computer readable, and thus NOT able to impart any functionality of the recited program. The examiner suggests:

1. Amending the claim(s) to embody the program on "computer-readable medium" or equivalent; assuming the specification does NOT define the computer readable medium as a "signal", "carrier wave", or "transmission medium" which are deemed non-statutory; or

2. Adding structure to the body of the claim that would clearly define a statutory apparatus.

Any amendment to the claim should be commensurate with its corresponding disclosure.

Note:

"A transitory, propagating signal ... is not a "process, machine, manufacture, or composition of matter." Those four categories define the explicit scope and reach of subject matter patentable under 35 U.S.C. § 101; thus, such a signal cannot be patentable subject matter." (*In re Nuijten*, 84 USPQ2d 1495 (Fed. Cir. 2007)).

Should the full scope of the claim as properly read in light of the disclosure encompass non-statutory subject matter such as a "signal", the claim as a whole would be non-statutory. Should the applicant's specification define or exemplify the computer readable medium or memory (or whatever language applicant chooses to recite a computer readable medium equivalent) as statutory tangible products such as a hard drive, ROM, RAM, etc, **as well as** a non-statutory entity such as a "signal", "carrier wave", or "transmission medium", the examiner suggests amending the claim to *include* the disclosed tangible computer readable storage media, while at the same time *excluding* the intangible transitory media such as signals, carrier waves, etc.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-2, 5, 8, 9-10, 13, and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Center, JR. (US 2003/0059124 A1), Guenter et al. (US 6,072,496), and Kroeker et al. (US 5,369,726).

Regarding claims 1 (method), 9 (unit), and 17 (CRM), Center discloses a metadata generation system comprising:

- clipping a plurality of different local areas of said image (as depicted in figure 1, numerals 28 and 30 to find head and eye, respectively);

- extracting frequency features for the respective local areas ("The invention advantageously uses a transformation into the frequency domain to more efficiently correlate the acquired image with the set of stored images" in paragraph 9, line 4. See also figure 9, numeral 330 "The system then normalizes the unknown facial image, as set forth in step 330 ... and converts the normalized image data into the frequency domain using DFFT 210B ..." in paragraph 99, line 1);

- projecting feature vectors, which are vectors consisting of said frequency features, onto predefined subspaces; thereby extracting the projected feature vectors of

the respective local areas so as to generate the projected feature vectors as face metadata (as depicted in figure 1, numeral 36: "The actual encoding or compression process can employ a Karhunen-Loeve transformation or an eigenvector projection technique, which encodes an image of a person's face or other facial feature, such as nose, eyes, lips, and so forth, as a weighted set of eigenvectors ... an image of a face is projected onto a face space defined by a set of reference eigenvectors. The reference set of eigenvectors, or eigenfaces, can be thought of as a set of features which together characterize the variation between face images within a reference set of facial images. This distribution of faces in the reference set of faces can be characterized by using principal component analysis to extract face information that characterizes the variations or differences between a newly acquired image (the projected image) and the eigenfaces ... Once the eigenfaces are identified an image signal can be represented as a function of these eigenfaces by projecting the image signal into the space defined by these eigenfaces" in paragraph 110, line 8.

Center does not explicitly disclose the usage of orthonormal basis matrix. Furthermore, Center does not disclose the division of the basis matrix with the square root of a corresponding eigenvalue.

Guenter, in the field of endeavor of 3D animation ("capturing a computer model of animated 3D objects, such as a human facial expressions" at column 1, line 9), teaches basis matrix for feature extraction, "[t]here are a variety of methods for decomposing a matrix into basis vectors and coefficients. Below, we describe one example of how principal component analysis can be applied to compress a matrix

representing time varying position of the 3D model. If we represent our dataset as a matrix A, where frame i of the data maps column i of A, then the first principal component of A is max $(A^T u)^T (A^T u)$. The u that maximizes the above-equation is the eigenvector associated with the largest eigenvalue of $A A^T$. which is also the value of the maximum. Succeeding principal components are defined similarly, except that they are orthogonal to all preceding principal components, i.e., $u_i^T u_j = 0$ for $j \neq i$. The principal components form an orthonormal basis set represented by the matrix U where the columns of U are the principal components of A ordered by eigenvalue size with the most significant principal component in the first column of U" at Guenter column 20, line 54.

It would have been obvious at the time the invention was made, that one of ordinary skill in the art would have been motivated to include the metadata generation system Center made, with the orthonormal basis matrix as taught by Guenter, such that the most important feature appears first, "the most significant principal component in the first column of U" at Guenter column 21, line 7.

The Center and Guenter combination does not explicitly teach the division of the basis matrix with the square root of a corresponding eigenvalue.

Kroeker, in the field of endeavor of pattern recognition ("in recognizing patterns in data-reduced versions of the speech" at column 1, line 16), teaches non-linear processor to extract features through eigenspace as shown in figures 20 and 21, "FIG. 20 defines a covariance matrix R 410 which is used in calculating various eigenmatrices ... The covariance matrix R is then used to calculate eigenvectors and associated

eigenvalues as shown in FIG. 21" at column 19, line 31. "Referring to FIG. 21, the eigenvalues are calculated in block 412 and ordered, with vector b_0 (from 414) being the eigenvector having the largest eigenvalue and b_{A-1} being the eigenvector having the smallest eigenvalue. The eigenvectors are then normalized by dividing each one by the square root of the corresponding eigenvalue to produce a vector b'_n 420 . The first B normalized eigenvectors, that is, the B normalized eigenvectors corresponding to the B largest eigenvalues, are assembled into eigenmatrix E_B424 ..." at column 19, line 38.

It would have been obvious at the time the invention was made, that one of ordinary skill in the art would have been motivated to include the metadata generation system of the Center and Guenter combination, with the square root of eigenvalue as normalizer as taught by Kroeker, such that "by selecting the information corresponding to the largest eigenvectors we are selecting the information which is most important for phoneme recognition after further processing" at Kroeker column 13 line 18.

Regarding claims 2 and 10, power spectral intensities of Fourier frequencies obtained by discrete Fourier transform are extracted as said frequency features (discussed in claim 1, the Discrete Fast Fourier Transform (DFFT) used for the analysis. Thus, the amplitudes of the DFFT coefficients, i.e. the power spectral intensities of DFFT, can be extracted as frequency features).

Regarding claims 5 and 13, said subspaces are specified by basis vectors previously obtained by principal component analysis for frequency features, and

frequency feature vectors are projected onto the specified subspaces to calculate principal component vectors (discussed in claim 1, the principal component analysis (PCA) used for the subspace data processing).

Regarding claims 8 and 16, wherein area positions corresponding to the respective local areas are searched as said local areas in said image, clipping positions are obtained, and after that, the local areas are clipped (depicted in figure 1, numeral 28 to find head, numeral 30 to find eye. Figure 6 is a more detailed schematic representation of the primary eye find stage 30 of figure 1).

Regarding claim 18, the Center, Guenter, and Kroeker combination discloses a metadata generation system comprising:

- a face image input unit for inputting a face image (as depicted in Center figure 1, numeral 22);

- a face metadata generating unit for generating face metadata from an inputted face image (as depicted in Center figure 2, detection stage #50 and PCA #36);

- a face metadata storage unit for storing generated face metadata therein, a face similarity calculating unit for calculating a similarity of a face from said face metadata, a face image database for storing said face images (as depicted in Center figure 1, numeral 34 "The image manipulation stage 34 places the image in suitable condition for compression and subsequent comparison with pre-stored image identification information" in paragraph 36, line 9);

- a controller for controlling, in response to a registration request and a retrieval request of the image, input of the image, generation of the metadata, storing of the metadata, and calculation of face similarity (as depicted in Center figure 1, numerals 26 and 34 "the frame grabber 26 is conventionally configured to capture and digitize image frames" in paragraph 39, line 7. See also "frame grabber 26 produces a digitized frame output signal 44 which is operatively communicated with multiple locations ..." in paragraph 40, line 1. "The image manipulation stage 34 places the image in suitable condition for compression and subsequent comparison with pre-stored image identification information" in paragraph 36, line 9);

- a display unit (as depicted in Guenter figure 28, numeral 347); wherein said face metadata generating unit comprises:

- area clipping means for clipping local areas of said face image (as depicted in Center figure 1, numerals 28 and 30);

- frequency feature extracting means for extracting frequency features for the areas clipped by said area clipping means (as depicted in Center figure 1, numeral 34 and figure 9, numeral 330. Reference to claim 1 for extracting frequency);

- vector projection means for projecting feature vectors, which are vectors consisting of the frequency features extracted by said frequency feature extracting means, onto predefined subspaces using an orthonormal basis matrix(as depicted in Center figure 1, numeral 36 "compression stage 36, which can be a principal component analysis compression stage. This stage produces eigenvectors from a reference set of images projected into a multi-dimensional image space. The vectors

are then used to characterize the acquired image. The compression stage 36 in turn generates an output signal which serves as an input to a discrimination stage 38, which determines whether the acquired image matches a pre-stored image" in paragraph 36, line 13. See also the claim 1 discussion at for the projecting feature vectors about the orthonormal basis matrix);

said face metadata generating unit extracts the projected feature vectors of a plurality of different local areas so as to generate the projected feature vectors as face metadata, said subspaces being predefined by basis vectors obtained by previously dividing a components of each basis vector in the basis matrix by the square root of a corresponding eigenvalue (as depicted in Center figure 2, PCA stage #36 "... This stage produces eigenvectors from a reference set of images projected into a multi-dimensional image space. The vectors are then used to characterize the acquired image ..." in paragraph 36, line 15. Also, reference to claim 1 for the discussion of orthonormal basis matrix and the square root of corresponding eigenvalue),

7. Claims 3-4 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Center, Guenter, and Kroeker as applied to claims 1, 9, and 17, and further in view of Satonaka et al. (US 6,236,749 B1).

Regarding claims 3-4 and 11-12, the Center, Guenter, and Kroeker combination discloses a metadata generation system with DFFT for the frequency features as discussed in claims 1 and 9. The Center, Guenter, and Kroeker combination does not explicitly disclose DCT or DST frequency features.

Satonaka, in the field of endeavor of feature extraction ("recognizing an object in a three-dimensional space based on the feature patterns of a two-dimensional image" at column 1, line 5), teaches the feature pattern transformation "by using a two-dimensional discrete cosine transform or a two-dimensional discrete sine transform, thereby obtaining frequency components in a two-dimensional space" at column 3, line 25.

It would have been obvious at the time the invention was made, that one of ordinary skill in the art would have been motivated to include the metadata generation system of the Center, Guenter, and Kroeker combination, with DCT/DST capability as taught by Satonaka, such that various frequency components can be extracted and "... a number of the components maximizes recognition precision" at column 3, line 34.

8. Claims 6-7 and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Center, Guenter, and Kroeker combination as applied to claims 1 and 9 and further in view of Philomin et al. (US 2003/0113002 A1).

Regarding claims 6-7 and 14-15, the Center, Guenter, and Kroeker combination discloses a metadata generation system with PCA used for the subspace data processing as discussed in claims 1 and 9. The Center, Guenter, and Kroeker combination does not explicitly disclose ICA or LDA processing.

Philomin, in the same field of endeavor of eigen feature study ("relates generally to person recognition" in paragraph 2, line 1), teaches the usefulness of eigenspace "... eigenface vectors can be used for identifying a person from a video image. In a similar manner, any method or system that generates eigenvoice vectors can be used for

identifying or verifying the identity of a person from audio information. In the present invention, the face feature data and voice feature data for any one person are concatenated to form a composite eigenvector, and this composite eigenvector is used for person identification and/or person verification" in paragraph 21, line 2. The dimension of voice supervector can be reduced "by any linear transformation that reduces the original high-dimensional supervectors into voice basis vectors. A non-exhaustive list of examples of linear transformation includes: Principal Component Analysis (PCA), Independent Component Analysis (ICA), Linear Discriminant Analysis (LDA), Factor Analysis (FA), and Singular Value Decomposition (SVD)" in paragraph 34, line 12. Furthermore, "Dimensionality reduction yields one voice eigenvector for each one of the training speakers ... The voice eigenvectors that make up the eigenvoice space each represent a different dimension across which different speakers may be differentiated" in paragraph 35, line 2. Without departing from the scope and spirit of Philomin's methodology, linear transformation such as PCA, ICA, and LDA can be applied to eigenface analysis.

It would have been obvious at the time the invention was made, that one of ordinary skill in the art would have been motivated to include the metadata generation system of the Center, Guenter, and Kroeker combination, with ICA and LDA transformation as taught by Philomin, such that "different speakers may be differentiated" in paragraph 35, line 9.

Response to Arguments

a) Summary of Applicant's Remark:

"Center, Jr. does not teach or suggest the feature of amended claim 1 in which the subspaces are predefined by basis vectors obtained by previously dividing a component of each basis vector in an orthonormal basis matrix by the square root of the corresponding eigenvalue" at response page 9, line 3.

Examiner's Response:

Applicant's argument is moot in view of the new grounds of rejection advanced herein above. Specifically, the Guenter et al. (US 6,072,496) reference now teaches the concept of orthonormal eigen matrix and the Kroeker et al. (US 5,369,726) reference now teaches the concept of division of eigen vector by the square root of the corresponding eigenvalue. Refer to the rejections above for further discussion.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eueng-nan Yeh whose telephone number is 571-270-1586. The examiner can normally be reached on Monday-Friday 8AM-4:30PM EDT.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wenpeng Chen can be reached on 571-272-7432. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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